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Government of Bombay

Report

on the

Working of the Development Directorate

For the Year ending 31st March 1925

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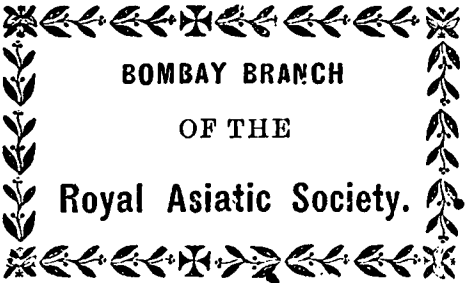

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REPORT ON THE WORKING OF THE DEVELOPMENT DIRECTORATE.

FOR THE YEAR ENDING THE 31ST MARCH 1925.

Work on the Back Bay Reclamation Scheme and on the Housing Scheme made steady progress during the year. The property market continued to be in a depressed condition, although there was a slight improvement compared with 1923-24, and expenditure in the suburban area was reduced to the minimum required to complete partly finished works, and no new works were undertaken in the suburbs except in connection with the distribution of water, the cost of which is recovered by sale proceeds of water. Building operations in completed town planning schemes showed signs of activity, but road making in schemes in hand was largely in abeyance owing to inability of the local authorities to provide funds. The establishment, both in the Housing and Suburban Divisions, was very considerably reduced.

2. In August 1924 Government requested the Advisory Committee to report how far, and in what directions, the activities of the Development Department should be continued or eliminated. Certain members of the Bombay Legislative Council were invited to join the Committee for the purpose of the enquiry, and one of these, Mr. A. N. Surve, M.L.C., accepted the invitation. The Committee submitted an interim report in February 1925 dealing with the Reclamation and Housing Schemes, as well as with the four Bombay Schemes. As regards the Back Bay Reclamation Scheme, the Committee reserved their opinion pending examination of the financial prospects by a sub-committee which they proposed to appoint. Their most important recommendation was that work on the East Colaba Reclamation should be closed down for the present, and that the advisability or otherwise of going on with it should be reconsidered when the filling of the Back Bay Reclamation is nearing completion.

3. A feature of the year was the commencement, in February 1925, of the running of electric trains by the G. I. P. Railway on the Harbour Branch, between Victoria Terminus and Kurla. The new system of traction will be gradually extended to all the suburban services in Bombay and its introduction may be expected to give a considerable impetus to the development of the suburban area.

BACK BAY RECLAMATION.

4. The diagram in the pocket of the report shows the progress of the construction of the sea-wall on 31st March 1925. By the close of the working season the mass concrete wall had been completed for the whole length of the rubble mound, and the wall finished in all respects

except for a gap of 1,800 feet. In June 1924 a heavy storm, associated with high spring tides, washed the temporary railway track off the wall in a number of places, but there was no damage to any of the permanent works.

5. *Kandivli quarry.*—During the year the quarry continued to supply material to the other divisions as required. There have been no notable additions to the plant, or any alterations in the lay-out. The out-put of the quarry from its commencement is as follows :—

Stone.

	Tons.
1921-22	38,474
1922-23	235,839
1923-24	399,280
1924-25	290,975

Earth.

Previous years	62,728
1924-25	182,282

Precast concrete blocks for storm-water drains.

1923-24	12,470
1924-25	17,470

The earth was used mainly in filling on the Reclamation area between the Marine Lines—Colaba Railway and the Colaba foreshore, as this area would have been very difficult of access for the pipes to supply dredged filling.

6. *Marine Lines Section.*—Work on the gantry was started on the 6th October and by the 11th December had been carried forward 1,500 f. ft., to r.d., 8,000, where work was stopped for the season. The rubble mound with the necessary protection stone was completed to r.d. 8,000 by the 31st March, 82,620 tons of stone being used in its construction. Last season's section of the concrete sea wall was completed to r.d. 6,480 by the 9th June, and this season's work was carried on from that point to r.d. 6,930 by the 31st March, the total amount of concrete deposited in the wall during the year being 137,700, c.ft. Storm-water drain no. 8 has been completed with the exception of the manholes which are now being constructed. Storm water drains no. 6 and no. 7 are in hand and are making satisfactory progress.

7. *Colaba Section.*—The rubble mound was completed to r.d. 11,728. The quantity of stone used in its construction being 128, 381 tons. The mass concrete wall was carried on from r.d. 5,733 to 10,056 by March 31st, a length of 4,233 r.ft., construction proceeding at the rate of 80 r.ft. per day. The quantity of concrete used during the year amounted to

304,838 c.ft. The progress on the construction of the six storm water drains in this section was as follows :—

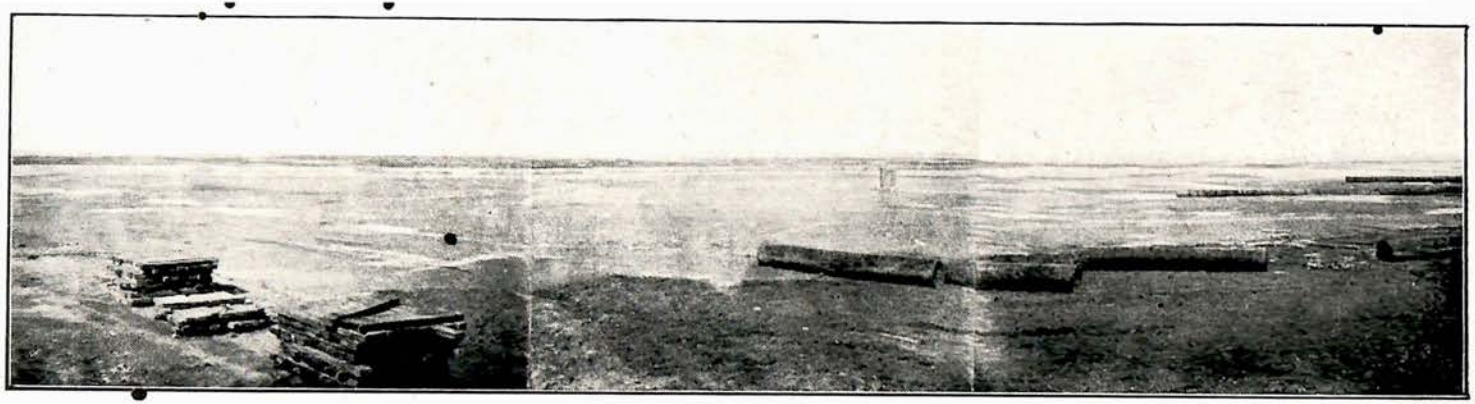
Drain No. 1	.. 2,984 r.ft. completed.
Drain No. 1A	.. 2,005 ,, completed, except for lining of outfall.
Drain No. 2	.. 3,519 r.ft.—2,200 r.ft. completed.
Drain No. 3	.. 3,625 r. ft.—1,846 r. ft. completed.
Drain No. 4	.. 3,604 r. ft.—514 r. ft. completed.
Drain No. 5	.. 3,539 r.ft.—90 ft. of foundation have been completed at shore end.

The dry filling between the Marine Lines-Colaba Railway and the shore was almost completed by 31st March and has since been finished.

8. *Dredging Section.*—The main feature of the year's work was the combined pumping operations at Colaba with the dredger "Sir George Lloyd" worked in conjunction with the intermediate pumping station "Colaba". Dredging operations for the season 1923-24 were stopped on the 15th of May 1924, when the plant was laid up for the monsoon during which all the craft were overhauled. The work of dredging a basin to give flotation for the intermediate pumping station "Colaba" in the harbour was commenced on the 20th September 1924 with the Royal Indian Marine bucket dredger "Cachalot". This vessel removed the soft material, but as a certain amount of hard ground was left above the required level, the Port Trust dipper dredger "Walrus" was hired, and completed the work on the 17th of November. The material obtained by dredging this hole was deposited in the area dredged over by the "Sir George Lloyd" this year. The "Sir George Lloyd" was moored in position to begin dredging between Oyster Rock and Sunk Rock Light House and the intermediate pumping station "Colaba" was placed in position on the 20th November, when the work of connecting up the floating pipe line commenced. This was completed on the 27th of November, but owing to strong ebb tides and the bad holding ground for the anchors of the pipe line, additional anchors weighing 30 cwts. had to be obtained and laid out to hold the line. This was done, the line moored in its correct position, and pumping operations began on the 6th of December, the two ships working double shift, the hours of work being from 5-30 a.m. to mid-night each day. The maximum length of discharge pipe from the dredger to the outlet in the military area was 10,123 feet, made up as follows :—

Length of floating pipe line between "Sir George Lloyd" and intermediate pumping station "Colaba"	.. ft. 5,701
Length of floating pipe line from "Colaba" to shore	.. 987
Length of shore pipe line	.. 3,435

During the season, up to 31st March 1925, a total of some 13 lakhs cubic yards of material had been pumped ashore and deposited in the military area.



View showing part of the area of 53·6 acres reclaimed with dredged filling at Colaba to within 3 feet of the finished surface.

9. It was decided to commence dredging in Back Bay with the "Kalu" in the area to the north of the alignment of the submarine cables, which will be subsequently transferred to the dredged area to enable the southern portion to be excavated. Work was commenced on 28th November 1924, but, owing to insufficient depth of water at low tide, it was necessary to confine dredging operations to a few hours at each high tide, during day light, until a sufficient excavation had been made to enable the dredger to float at all states of the tide. Unfortunately, a layer of hard clay and sandstone was found which delayed the work and, as flotation had not been secured by the end of the season, the progress made was disappointing. After the monsoon it is proposed to extend the shore pipe for some distance into the bay on a gantry which has been constructed for the purpose, and, as this will enable the dredger to work in deeper water, it is hoped that the difficulties met with this year will be eliminated.

10. By the end of the 1924-25 working season, 2, 59, 555 square yards, or 53·6 acres, of the military area at Colaba had been filled with dredged material to within an average of 3 feet below the finished level, the average depth of filling being 10 feet. The remainder of the military area had been filled to a depth of 2 feet. In addition to dredged filling, an area of 77,111 square yards, or 15·7 acres, had been filled with dry material, up to finished level, between the Marine Lines—Colaba Railway and the former shore line, the average depth being 7·5 feet.

11. *Sanitary Committee.*—The report of the Sanitary Committee for the year ending 31st March 1925 is printed as appendix A to this report. It will be seen that the Committee are satisfied with the steps taken under their directions to secure the health of the population living near the reclaimed areas, and have expressed their appreciation of the work done by the Medical and Sanitary Officer, Colaba, and his staff. The names of the members of the Sanitary Committee during the year are given in appendix B.

East Colaba Reclamation.

12. The rubble mound was commenced during the year, but the work was closed down at the end of the period under review, Government having decided to accept the recommendation of the Advisory Committee, referred to in paragraph 2 above. A small amount of protection stone was placed on the exposed side of the rubble mound already constructed in order to prevent possible damage by wave action.

Industrial Housing in Bombay.

13. According to the original programme the equivalent of 225 chawls or 18,000 tenements should have been completed by the end of the year under review ; of these 90 chawls or 7,200 tenements should have been erected during the year. Owing, however, to the orders received from Government to the effect that no further chawls should be commenced till those in hand are fully completed (*vide* paragraph 13 of last year's report), the programme resolved itself into one of completing, as far as possible, the 211 chawls at Worli, Naigaum, DeLisle Road and Sewri sites.

14. *Worli.*—The equivalent of about 45 chawls were constructed, whilst the sewerage scheme for the whole area was practically completed during the year. Estimates for the roads, storm-water drains and water-supply systems were prepared and sanctioned and all these works have been given out on contract and are now in progress. It is anticipated that this area will be fully completed by December 1925.

15. *Naigaum.*—The chawls of plot A were finished in every respect, whilst those of plot B were almost completed before the end of the year. The sewerage and the water-supply of plot B are under construction, whilst for the storm-water drainage system, a design has been drawn up and the estimate is under preparation. On this area the equivalent of 12 chawls were constructed during the year, and it is anticipated that the work will be fully completed by the end of June 1925.

16. *DeLisle Road.*—All chawls together with roads, sewers, storm-water drains and water-supply systems were completed during the year.

17. *Sewri.*—The equivalent of 7½ chawls were completed, but owing to difficulties connected with water-supply and drainage, only two chawls could be handed over for letting. Now, however, these difficulties have been overcome, and it is anticipated that 12 chawls, together with water-supply, drainage, etc., will be completed before the end of July 1925. It has not been possible to commence the construction of four chawls on the south of this site owing to the difficulties met with by the Bombay Port Trust, in connection with the removal of the rock to the west of the chawl area. It is probable that it will not be possible to undertake the construction of these four chawls for another 18 months and, such being the case, the question as to whether they should be built at all is under consideration.

18. The 211 chawls included in the present instalment of the original scheme contain 80 tenements each, with the exception of one chawl at Naigaum, which contains 64 only. The total number of tenements is, therefore, 16,864, and as the final revised estimate amounts to Rs. 351,57,100, the cost per tenement works out to Rs. 2,084. The analysis of this figure is given below :—

Item.	Cost per tenement.
	Rs.
(1) Land, acquisition, clearing, filling and levelling ..	354
(2) Chawl buildings, including sanitary fittings ..	1,446
(3) Sewerage	50
(4) Water-supply	41
(5) Storm-water drainage	27
(6) Roads, including footpaths and lighting ..	23
(7) Tools and plant (net)	22
(8) Railway sidings (net)	11
(9) Miscellaneous (net)	9
(10) Establishment	101
Total ..	2,084

19. The Chairman, Bombay City Improvement Trust, has kindly provided figures of the cost of 4,504 tenements constructed by the Trust since the war as follows :—

	Cost per tenement. Rs.
Chawl buildings, including sanitary fittings, and establishment charges	1,570
Total cost, including land	1,914

In the analysis given in paragraph 18, establishment charges are shown separately, and amount to 5 per cent. Adding this percentage to the cost of buildings in the case of the Directorate Chawls, the comparison is as follows :—

	Cost per tenement.	
	Directorate chawls.	Improvement Trust chawls.
	Rs.	Rs.
Chawl buildings, including sanitary fittings, and establishment charges	1,518	1,570
Total cost, including land	2,084	1,914

The slightly lower cost of buildings in the case of the Directorate chawls is probably the result of economics possible in a larger construction programme. The higher *total* cost of the Directorate chawls is due to heavier expenditure on roads, sewers and storm-water drains, necessitated by the extensive nature of the sites ; the extreme case being at Worli where a sewerage scheme for 60,000 inhabitants has had to be provided.

PROVISION FOR THE EXPANSION OF INDUSTRIES OUTSIDE BOMBAY.

20. *Suburban Scheme No. 1-Kurla-Kirol.*—There was no further development in this scheme during the year. The question of letting part of the area for cattle stables was under consideration, and, in the absence of demand for sites for small industries, this may be a possible alternative means of disposing of the land.

21. *Suburban Scheme No. 2-Trombay North-East.*—No works were carried out in the scheme, since the question of the removal of the tanneries from Dharavi is still unsettled. Apart from the areas required by the Bombay Municipality in this scheme, which were referred to in paragraph 18 of last year's report, there were no demands for land in the scheme and further development must await the extension of the Kurla-Chembur Railway.

22. *Suburban Scheme No. 15-Ambernath.*—The Swedish Match Factory was completed and commenced working during the year, and a further area of 1·5016 acres was taken up by the firm for extensions which were nearly finished by the end of the year. Enquiries on

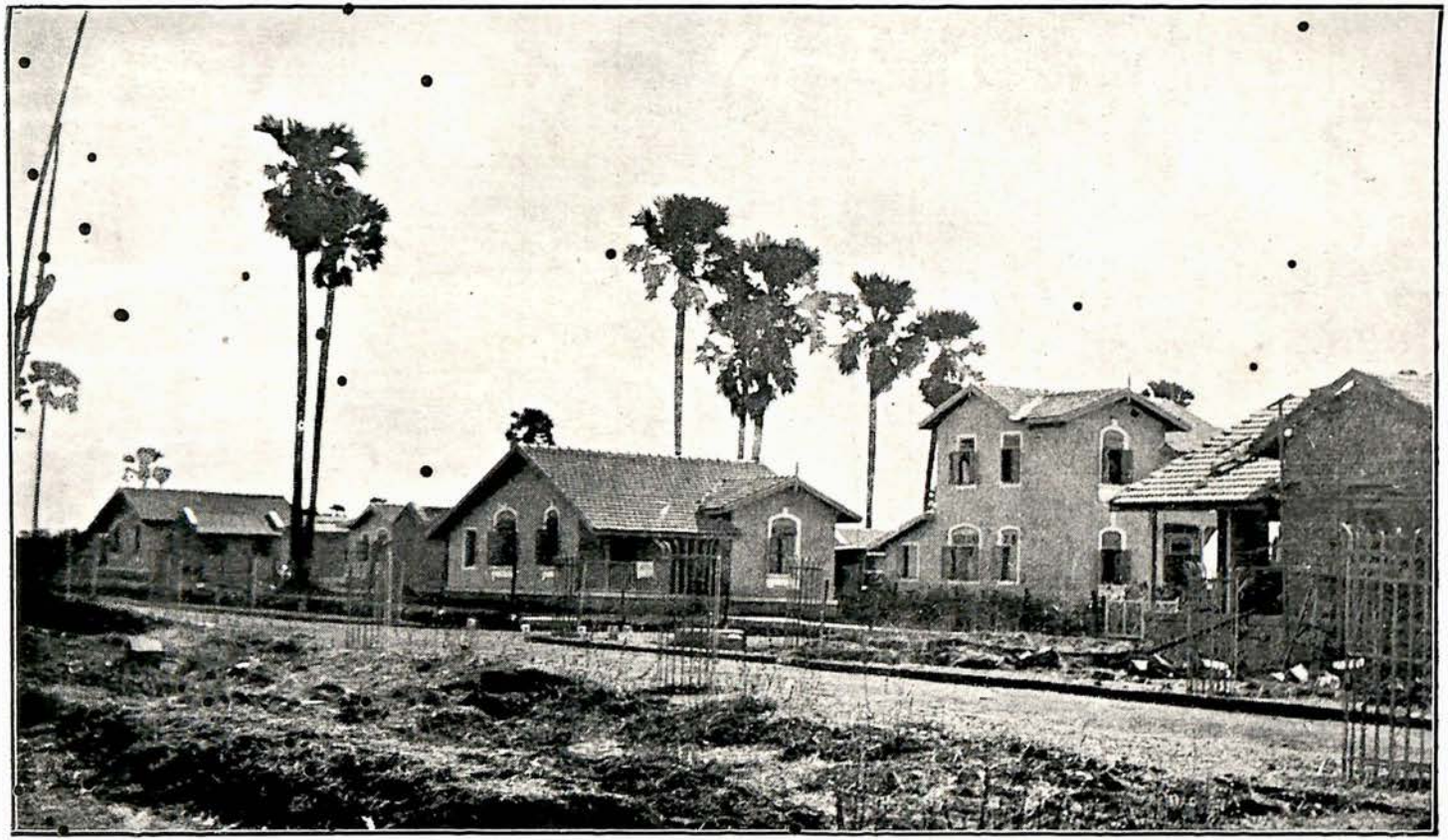
behalf of two important concerns regarding proposals for the erection of large factories in the area were dealt with during the year, and further developments in this connection are expected next cold weather. The small activated sludge plant was completed and brought into use during the year and is working satisfactorily. The arrangement of sidings for serving existing and future factory sites was settled with the G.I.P. Railway Company, and the earthwork of the sidings most urgently required was in hand at the end of the year. Otherwise development work remained in abeyance pending erection of more factories. The roads and storm-water drainage were maintained in good order during the year.

23. *Suburban Scheme No. 21-Permanent Water-Supply at Ambernath.*— The temporary water-supply, which has been in use from the commencement of the development of Ambernath, was finally closed down in October 1924, when the entire distribution service was changed over in stages to the permanent supply. This was done without any inconvenience to consumers, and no interruption of the service has occurred since the permanent supply was brought into use. The present supply has therefore now its source of origin confined to the Ulhas River at Badlapur from whence the water is pumped for distribution to a reservior having a capacity of three million gallons. It has not been possible as yet to bring the filtration plant at the water works into service, but by the end of the current year the whole of the sanctioned works associated with the water works section of the industrial scheme will have been completed and brought into operation.

24. *Suburban Scheme No. 23-Supply of Electric Power at Ambernath.*— The power station was completed during the year and a medium pressure (440 volt) three phase service was brought into operation on the 1st October 1924. The plant at present in use comprises two 100 b.h.p. Mirrless Diesel oil engines coupled direct to 60 Kilowatt three phase alternators. Automatic voltage regulation is provided for, and parallel operation has proved quite satisfactory to date. Distribution is by overhead work and, as the economic conditions have not yet justified a continuous (24 hours) service, the present supply is confined to a day power load only. During the six months ending 31st March 1925, 38,995 units were sold for factory purposes.

Suburban Development.

25. During the year under review, there has been a slight but noticeable recovery in the land market in Suburban Bombay. Prices have ceased the downward movement, and there is a steady enquiry from would be plot-purchasers. There is little doubt that one of the chief contributing factors to this awakened interest is the inauguration of the State-aided building scheme. Under this scheme, Government advances three-fourths of the price of the plot and, in addition, up to half the cost of the bungalow, the borrower repaying the loan in 5, 10 or 15 years by monthly instalments with 6 per cent. interest. The sum originally allotted



Typical cottages erected in S.S. No. 7, Khar.

for such advances was Rs. 3 lakhs, and by the end of the year, 37 plot-purchasers had applied for advances totalling Rs. 2,50,991, whilst a further sum of Rs. 3 lakhs has been set apart for this purpose in the current year. This assistance is confined to those purchasing plots in Directorate schemes, whose means do not enable them to build a cottage costing more than Rs. 10,000, but, in practice, some latitude has been allowed in regard to this limit.

26. The extensive advertising scheme of the Department has also attracted attention to the suburbs, the advantage of a house and garden in healthy surroundings having been continually brought before the public by the medium of half and quarter page advertisements in the leading English and vernacular papers. Apart from the factors mentioned, the gradual extension of a piped water-supply in Salsette, and the inauguration of the electric suburban railway service, will no doubt give a further impetus to Suburban Development. There has been, and still is, a great deal of pioneer work to be done in persuading Bombay inhabitants to live in the suburbs. But much has been accomplished in this direction as is evidenced by the brisk enquiry for the series of illustrated booklets issued by the Department. Users of the Bandra-Ghodbunder Road cannot fail to notice the building activity in evidence as far north as Andheri, both in Directorate, and in town planning schemes.

27. In all Directorate schemes, as well as in all town planning schemes, the rules now expressly forbid the erection of chawls, and also of buildings of greater height than a ground and one upper-floor. This combined with wide roads, the stipulation that all houses must cover not more than one-fourth of the area of the plot, and be set back 20 feet from the side of the road, will ensure sane and healthy development, with maximum access of light and air for all. Zoning also is insisted on. Shops are confined to separate and specially allotted areas, whilst buffalo stables are prohibited, except in places isolated from residential areas, thus ensuring the possibility of continuous enjoyment of peace and quiet to the dweller in the suburbs.

28. Extensive denotifications of land have taken place during the year under review. Nine hundred eighty-two acres in Trombay, and 2,569 acres in Salsette have been released, and further areas not required in the near future will probably be denotified before long. The original purpose of the notifications in 1921 has been served, for land speculation in Salsette generally has been checked in the four years that have elapsed, and values are now practically normal.

Town Planning Schemes.

29. *Santa-Cruz Town Planning Scheme No. 2.*—As in 1923-1924 work on this scheme was at a standstill during the year for want of funds. The current repairs of roads already constructed were carried out at a cost of Rs. 3,922.

30. *Vile-Parle Town Planning Scheme No. 1.*—The work on this scheme, which covers 38 acres, was practically completed, except that

the storm-water drains remain unfinished owing to want of funds which the Notified Area Committee were unable to provide. All roads in the scheme were maintained in good order at a cost of Rs. 1,594.

31. *Andheri Town Planning Scheme No. 2.*—The scheme was completed in 1923-1924, but funds are required for the repair of roads which have suffered on account of the heavy lorry and cart traffic from the Gilbert Hill quarry.

32. *Malad Town Planning Scheme No. 1.*—The scheme is partly finished, but funds are not available at present to complete it.

33. As regards new town planning schemes, the following were completed and published in book form during the year :—

Ghatkopar Town Planning Scheme No. 1.
Santa Cruz Town Planning Scheme No. 3.
Vile Parle Town Planning Scheme No. 2.

These schemes deal with the holdings of 290 owners and will open up over 6 lakhs of square yards for building purposes. A fourth scheme, Vile Parle, 4 and 4-A, has been finally drawn up and is expected to be published by September next. The awards in two schemes—Vile Parle No. 3 and Santa Cruz No. 4—will be adjudicated upon by the tribunal during the present year, and the books are expected to be published before January next. Similarly the award in Ghatkopar Town Planning Scheme No. 2 and its final publication in book form will, it is hoped, be completed by March 1926. Two schemes, Borivli Town Planning Scheme No. 2 and Santa Cruz Scheme No. 5, are in the preliminary arbitration stage. About a year will elapse before the awards are published.

34. To summarise the progress of town planning schemes, it may be stated that 9 schemes were prepared by the Consulting Surveyor to Government before the creation of the Development Department, and the records of these schemes have been transferred to the latter for issue of certificates of tenure and title to the owners in the schemes. Within the five years of the existence of the Development Department, 7 schemes will, it is expected, be completed and added to the 9 previously in existence. Another scheme, and a very important one, Bandra Town Planning Scheme No. 3, will probably be revised and the area reduced. The total number of town planning schemes on record, and in various stages of completion, is now 26, covering an area of some 1,800 acres, and within the next 4 or 5 years it is hoped to have them all completed and ready for building purposes.

Suburban Schemes.

35. The list of suburban schemes remains as indicated in paragraph 33 of last year's report. Schemes Nos. 1, 2, 15, 21 and 23 have already been referred to in this report and the position as regards the remainder is as indicated below.

36. *Suburban Scheme No. 3—Trombay North-West.*—In the Chembur Sector of this scheme, to which development has so far been restricted,

Cottage built for demonstration purposes in S.S. No. 3, Chembur Garden Suburb. For plan and details see plate D accompanying report of the Directorate for the year ending 31st March 1924.

there has been good enquiry for land and the plots disposed of include 70,000 square yards to the St. Anthony's Homes Society, who propose to build model bungalows on 70 plots, and have reserved sites for a school and a church. Building operations will commence when the negotiations, now in hand, for a loan from the Registrar of Co-operative Societies, are completed. Enquiries have been received from other communities also, and it is hoped will result in disposal of further land in this scheme. A model bungalow costing Rs. 5,600, or Rs. 6,000 with land, has been built close to Chembur railway station and is being used as an estate office, thus serving a double purpose in showing prospective plot-purchasers what can be built for a modest sum and also (there being a clerk in attendance from 10 a.m. to 5-30 p.m. daily) affording enquirers information on the spot regarding this garden suburb.

37. *Suburban Scheme No. 4—Trombay West.*—The lands in this scheme, which covered a large sector of the Trombay Hill, have been entirely denotified, with the exception of certain areas reserved for the Port Trust in connection with possible future dock schemes.

38. *Suburban Scheme No. 5—Malavni.*—No works have been undertaken, or are contemplated, in this scheme.

39. *Suburban Scheme No. 6—Danda.*—Road making in the scheme was completed during the year to provide access to plots which have been sold at rates varying from Rs. 7-8-0 to Rs. 10 per square yard according to situation. In all 13,065 square yards had been disposed of in this scheme by the end of the year, out of a total of 80,806 square yards available. The Turner Road extension, which is to be carried out by the neighbouring Catholic Housing Society, through whose scheme it passes, had not been commenced by the end of the year.

40. *Suburban Scheme No. 7—Khar.*—The new railway station was opened in July 1924 and 43 trains now stop daily. Sales of plots have proceeded briskly in sector B which is fully developed, and no less than 134,649 square yards had been disposed of by 31st March 1925, out of a total net area of 583,691 square yards for the whole scheme. A number of houses are under construction and more will be commenced in the near future. Sales have commenced in sector A and some plots have been sold opposite the station and shops will shortly be built on them. If the progress of disposal of plots in sector B is maintained, it may be necessary to construct a few roads in sector C during the current year, as enquiries for plots in this area are already being received.

41. *Suburban Scheme No. 8—Chapel Road, Bandra.*—Further sales of land during the year reduced the balance of land on hand to 9 plots, covering 7,946 square yards only, out of a total net area of 104,768 square yards. The scheme showed a small surplus on 31st March 1925, which will be increased by the proceeds of the remaining plots when sold.

42. *Suburban Schemes No. 9—Murzbanabad, No. 10—Aerodrome near Gilbert Hill, and No. 11—Rann of Juhu.*—There were no developments in connection with these schemes during the year.

43. *Suburban Scheme No. 12—Suburban Trunk Roads.*—No work other than current repairs to trunk roads were carried out during the period under review The reconstructed Bandra Ghodbunder Road, between Bandra and Andheri, was handed back to the Public Works Department for maintenance soon after the close of the year.

44. *Suburban Scheme No. 16—Shahar (Andheri Sector).*—This scheme remained in abeyance.

45. *Suburban Scheme No. 18—Kirol North.*—There was no further expenditure on development in this scheme during the year, but the five roads constructed in 1923-1924 were maintained in good order. Twelve plots, aggregating 21,258 square yards, were disposed of, making a total area of 22,318 square yards sold in this scheme up to 31st March 1925.

Water Supply in Salsette.

46. *Suburban Scheme No. 19—Water-supply in Salsette.*—The rate for the bulk supply of water to the Directorate for distribution in Salsette was increased by the Bombay Municipality at the close of the year from 4 annas to 5 annas per 1,000 gallons. The question of the necessity of adjusting the charges to consumers to meet this enhancement was under consideration.

47. *Water-supply to Santa Cruz and Juhu.*—The work was completed early in the year under report at an actual cost of Rs. 1,24,713 against the sanctioned estimate of Rs. 1,43,095. A sufficient supply of water is now available for the whole of Santa Cruz and the southern portion of Juhu. The daily consumption rose considerably during the year, and by the time Santa Cruz Town Planning Schemes Nos. 3 and 4 are completed, a further substantial increase is likely.

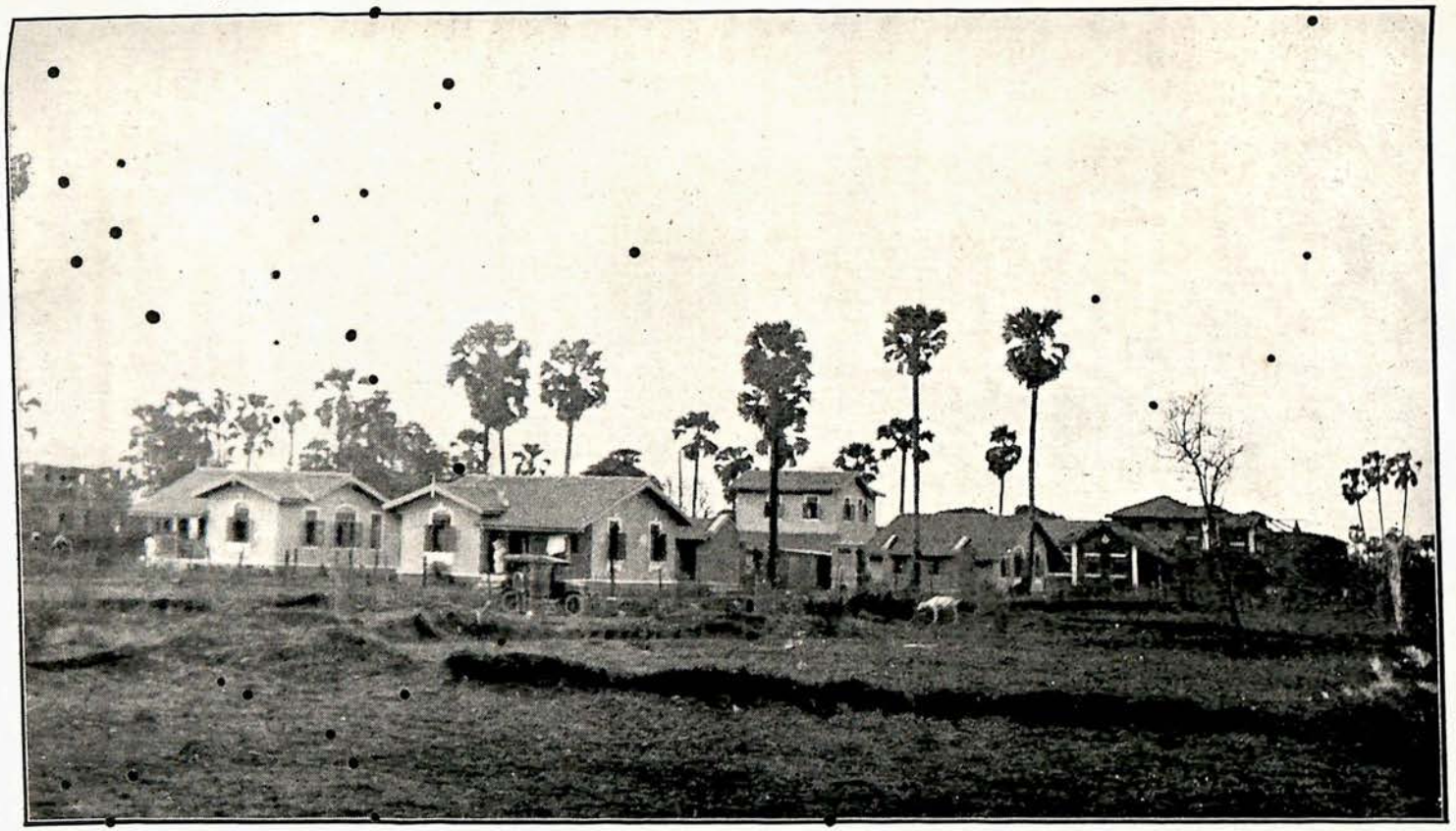
48. *Additions and alterations to Andheri Water-supply.*—Two additional works were sanctioned in connection with this scheme during the year, *viz.*, extensions to the Gaud Saraswat and Hindu Friends Societies Estates. The whole work, including the extensions, was completed during the year and the supply made available from February 1925. The actual cost amounted to Rs. 1,38,535 against the estimate of Rs. 1,44,405.

49. *Water-supply to Ghatkopar.*—A detailed scheme for the supply of water to the Ghatkopar-Kirol Municipality, estimated to cost Rs. 1,74,259, was under consideration at the end of the year.

50. *Water-supply to Suburban Scheme No. 7—Khar.*—An estimate, amounting to Rs. 1,57,000, of the cost of providing a permanent supply of water to this scheme was prepared during the year and was under consideration at the close of the period.

Drainage Schemes in Salsette.

51. *Suburban Scheme No. 13—South Salsette Drainage.*—A sewerage scheme for Bandra was worked out during the year and received the approval of the Bandra Municipality. It is estimated to cost Rs. 6,67,168



Typical cottages erected in S.S. No. 7, Khar.

and was under consideration by Government at close of the year. A sewerage scheme for Kurla estimated to cost Rs. 9,30,000 was also prepared but was under revision at the end of the period of review in connection with proposed modifications of the outfall.

Railway Schemes.

52. *Suburban Scheme No. 17—Salsette-Trombay Railway.*—During the year it was decided to start an experimental tramway service, and three light bogie coaches were ordered from a Calcutta firm through the Indian Stores Department. These are expected to be delivered in August next. The G. I. P. Railway made no progress with the bridge over their line at Kurla, but the necessary steelwork was ordered. It is hoped that the bridge will be completed during the current year.

53. *Suburban Scheme No. 22—Kurla-Trombay Railway.*—There were no further developments in this scheme by the Directorate but the G. I. P. Railway increased the number of trains running between Kurla and Chembur. The negotiations with regard to the terms of working the line have led to a proposal that the G. I. P. Railway should take over this railway as a branch of their undertaking and extend it to Mandala. The terms of transfer are under consideration.

Organization of the Supply and Transport of Building Materials.

54. *Sand and Shingle*—The dredger 'Drudge' worked efficiently at Mumbra for the greater part of the year, but owing to the curtailment of the housing programme and to the slump in the building trade in Bombay, it has not been found feasible to work the dredger at a greater pace than to produce an output of 130 brass of material per day. Although the dredger has effected reductions in the cost of the shingle and sand required by the Department, it has not been possible to secure the benefits which would have accrued, had the Department's programme of chawl construction work continued for a couple of years more. If the chawl programme had been pursued as anticipated originally, the dredger would have been enabled to work to its full capacity, and it is estimated that it would have paid for itself within two years. Unless other works are commenced soon, it may be found necessary to dispose of the dredger in the near future. The total quantities of shingle and sand dredged during the year amounted to 2,143,250 Cft., but it should be stated that the dredger did not work for the four monsoon months.

55. Some doubt having been expressed regarding the suitability of Mumbra sand and shingle for use in ferro-concrete work, Messrs. J. A. Mitchell and Company, Cement Specialists, were asked to investigate the matter, and a copy of their report is printed as appendix C. It will be seen that, as a result of tests and experiments extending over twelve months, Messrs. Mitchell and Company find that concrete prepared from Mumbra sand and shingle, if well made in the correct proportions,

becomes practically impervious to moisture in a short time, and that under such conditions the iron minerals in the sand and shingle are not likely to prove a source of weakness.

56. *Cement.*—There was no hitch in the supply of cement throughout the year. The Dwarka Cement Company, which produced the most expensive cement, fell out of the contract and their share of the supply was assigned to the Central Provinces Cement Company on terms which were more favourable to the Department. The total supply of cement to works during the year was 21,586 tons.

57. *Other materials.*—The supply of other materials, excepting bricks, was restricted during the year. No further bricks were manufactured, but 57,43,844 bricks were supplied to works leaving a balance of 35,00,710 bricks on stock at the end of the year.

Transportation.

58. *Railway sidings.*—The railway sidings at Mumbra, Matunga and Worli were in use throughout the year ; the sidings at DeLisle Road and Sewri were removed after the transportation of all materials necessary for the works : the siding at Worli having served its purpose is now being dismantled.

The subjoined table shows the approximate tonnage hauled over each siding during the year :—

Sidings.	Wagons.	Tons.
Mumbra	5,053	111,166
Matunga	1,065	21,706
Worli	2,339	48,971
DeLisle Road	..	..
Sewri	466	9,862

59. *Steam lorries.*—A certain number of steam lorries were in requisition during the year for supplying materials to sites not fed by railways direct. Approximately 41,700 tons were transported by lorries during the year. The surplus lorries and trailers were advertised for sale, but only one lorry was sold : it has now been decided to reduce the prices to conform with market rates for second-hand lorries which, it is hoped, will help to effect their sale.

Total Supplies.

60. The following statement gives the quantities of the principal materials supplied to works from all sources during the past 4 years :—

Materials.	Unit.	1921-22.	1922-23.	1923-24.	1924-25.	Total.
Sand ..	Cft.	405,266	1,390,535	2,376,223	1,785,551	5,957,575
Shingle ..	,,	226,565	1,192,575	1,639,903	1,000,623	4,059,666
Cement ..	Tons.	8,212	15,336	38,412	21,586	83,546
M. S. bars and wires.	,,	1,859	1,451	3,588	1,390	8,288
Coal ..	,,	934	16,087	10,976	7,610	35,607
Vasind bricks ..	Nos.	..	154,364	755,534	5,743,844	6,653,742

Bombay Suburban Survey.

61. The field work was closed down from 6th June 1924 during the monsoon months, and the surveyors were sent away on departmental leave; the traversers rejoined for duty on 22nd September and the detail surveyors on 6th October.

62. *Traverse survey.*—In April and May the villages between Hariali and Mulund on the G. I. P. Railway were traversed in advance, and after the monsoon was over the traverse survey of the remaining area in the north of the district, between Goregaon and Dahisar, was taken in hand. The total area traversed during the year for work on the 330 foot scale was 29,268 acres or 45·7 square miles, and the area traversed during the year for work on the 40 foot scale was 796½ acres. Since the survey programme, as regards traversing, was completed on the 28th February, the services of the two traverse surveyors were dispensed with from 1st March 1925.

63. *Detail survey on scale 40 feet to 1 inch.*—The 40 foot scale survey of Chembur and Ghatkopar areas was continued during April and May, and completed before the out-door work was shut down. The total area surveyed in detail amounted to 1,529 acres.

64. *Detail survey on scale 300 feet to 1 inch.*—After the monsoon period the 330 foot scale survey of the remaining areas in the district was commenced; the villages of Kanjur, Bhandup, Nahur and Mulund were first taken up and the detail surveyors then transferred to the Goregaon-Malad area. By the end of the financial year all the villages in the north of the district, except Manori and Gorai, had been completely surveyed on the 330 foot scale. The total area amounted to 23,360 acres or 36·5 square miles.

65. *Fair mapping and printing of sheets.*—One index map and 43 maps on the 330 foot scale were printed in colours during the course of the year. Thirteen maps on the 330 foot scale and 99 maps on the 40 foot scale were also fair drawn for publication.

Advisory Committee.

66. The usual meetings of the Advisory Committee were held during the year, in addition to special meetings to consider the reference from Government referred to in paragraph 2 of this report. The payment of fees to members for attendance at meetings was sanctioned by Government in Government Resolution, Development Department, No. S.D.-26, dated the 6th January 1925, on the scale adopted by the Port Trust and City Improvement Trust. A list of members serving during the year is given as Appendix D.

Organisation of the Directorate.

67. The organisation of the Directorate is shown in Appendix E. There was a further reduction in establishment during the year in the Housing and Suburban Divisions.

H. A. L. HEPPER,
Director of Development.

APPENDIX A.

Copy of the report of the Chairman, Sanitary Committee, Bombay Development Directorate, on the sanitary condition of the Reclamation for the period from the 1st April 1924 to 31st March 1925.

During the year nine meetings of the Sanitary Committee were held and the reclamation works were inspected on each occasion.

The arrangements previously made by the Municipal Commissioner for the City of Bombay about paying Rs. 100 to Captain Chalam to cover the wages of the two coolies engaged for work in Colaba in the municipal areas and the cost of supervising their work through the Reclamation Malaria Inspectors were terminated from 1st June 1924, as the Corporation disapproved of this proposal. Instead, one Sub-Inspector and two coolies from the Municipal Malaria Department were placed under Captain Chalam for this work and their wages were paid by the Municipality.

A great deal of consideration was given to the question of the new site for the coolies, when after inspection and discussion the following resolution was passed :—

(*a*) On general principles and on grounds of public health the Committee considers that the presence of a cooly camp either in its present position or on the new one proposed is objectionable and think that every attempt should be made to find a site elsewhere.

(*b*) If it is impossible to find a new site, it has considered the objections raised by the General Officer Commanding to the new site or newly reclaimed land which is proposed.

(*c*) The Chief Engineer assures us that the water carriage system of sewage disposal in the proposed camp can be satisfactorily arranged and that the nuisance which has been suggested is not likely to arise.

If his expectations are correct, this part of the objections falls to the ground.

To meet the æsthetic objections brought forward, he states that he is prepared to erect a twelve foot barricade of galvanised iron on the land side of the camp, so that all but the top rooms of the new flats will not look into the camp and he will build in addition a lattice on which quickly growing creepers will grow and so hide the unsightly iron fencing.

(*d*) The new camp he says is to be closed completely from the land side and further by policing and other disciplinary measures some of the objections to the presence of coolies will be obviated.

(*e*) We consider that, even if it is found necessary to place the camp on the site suggested, such location should be considered as purely temporary and that as soon as it is possible another area should be

reclaimed further away from residential sites and the cooly camp should be moved thereto, where its presence will give rise to the minimum objection to residents.

(*f*) We are of opinion that, if these measures are taken, the danger to health and the æsthetic objection to the new site will not be greater than they are to the camp as at present situated.

(*g*) Further we are strongly of opinion that in no case should the population in the camps be increased by fresh drafts from outside.

The cooly camp has now been removed from the proposed site.

Lt.-Col. R. M. Carter, C.B., F.R.C.S., I.M.S., resigned the Chairmanship of the Committee when the following resolutions were passed :—

1. We are of opinion that the resignation of Lt.-Col. R. M. Carter, C.B., F.R.C.S., I.M.S., be sent to the Secretary to Government, Development Department, with an expression of regret. The Committee place on record the very valuable help and assistance given by him as Chairman of the Committee and they regret his separation owing to pressure of work.

2. The Committee is of opinion that the name of Lt.-Col. F. P. Mackie, O.B.E., M.D., M.Sc., F.R.C.P., F.R.C.S., I.M.S., be recommended to the Secretary to Government, Development Department, as permanent Chairman of the Committee. He has already acted as Chairman from 14th April 1923 and has shown a deal of energy and activity in the disposal of business. His wide experience and knowledge have been of great assistance in solving the difficult problems on the Reclamation Scheme.

Lt.-Col. F. P. Mackie, O.B.E., M.D., M.Sc., F.R.C.P., F.R.C.S., was appointed Chairman under Government Resolution No. S.D.-1354, dated the 3rd September 1924.

Captain Chalam's quarterly report for the quarter ending 30th September 1924 was discussed and it was resolved that all hollows that are now existing as well as new pits that may be formed hereafter at the junction of the pipes should be filled before the next rainy season.

The following observations in Captain Chalam's report are worth noting :—

There were a large number of surface pools immediately after the commencement of the rains which required constant care. These pools were accessible and the reclaimed area did not present any unusual difficulties for the men to walk upon for purposes of search or treating with a larvacide. A fair amount of breeding was noticed during the months of July and August, but there was a sudden increase in breeding places in the reclamation area during the later part of September. A large number of pools both in the reclaimed and unreclaimed portions showed signs of mosquito life and were effectively dealt with. Complete absence of larvæ was not expected as ova were continually hatching out, but the comparative absence of full grown larvæ and the almost

entire absence of pupae in these pools was satisfactory to show that few of them were allowed to reach maturity.

Reclamation pools being comparatively clean, collections of water showed 95 per cent. of anophelines. Outside the reclamation the Military Officer made a cojnoint inspection with Captain Chalam, the Medical and Sanitary Officer of the Development Department, twice a week, house to house, for breeding places.

The following species of anophelines were detected as adults in an adult catch initiated in the barracks and the reclamation camp at Colaba in the last week of September :—

A. rossi	..	..	14
A. stephensi	..	..	1
A. culicifacies	..	..	1
A. fulijinosus	..	..	2

The spleen rate of the children in the reclamation camp was 3·3 per cent. and the parasite rate was 10·8 per cent.

Considerable breeding was noticed in trees in the military area. On examination of 1,675 trees, 97 were found breeding profusely culex and stegomyia larvæ. All these holes were filled in.

It is believed by some people that the increase in the incidence of malaria in the City of Bombay in 1924 was due to the breeding in the reclamation area, but as shown above, although larvæ were found, effective steps were taken by the Medical Officer to destroy them by a larvacide.

The pumping operations commenced also at Marine Lines in January 1925. The material dredged is ideal from an anti-malarial point of view, being practically all sand and it settles down smoothly and evenly without holding any collections of water and without any fissures or cracks in the surface. The material is dredged from Back Bay and not from the harbour as is the case at Colaba end. This exactly coincides with the Committee's anticipation from the experimental pits which were put up in the early stage of the Reclamation.

Temporary breeding places which were created during the rainy season in Colaba rapidly vanished with the stoppage of the rains. As for permanent breeding places steps were taken to render mosquito proof the few remaining insufficiently covered wells and water cisterns in Colaba.

The bi-weekly examination of all municipal and military areas in Colaba was continued in conjunction with the Military Malaria Officer and the Municipal Health Department staff.

The five cooly camps were supervised carefully by the Medical and Sanitary Officer. The average total strength of labour in these camps was approximately 1,620.

There was no epidemic of any disease in any of the camps during the period. Two cases of small-pox in the Marine Lines area were found concealed but they were detected and removed to the Arthur

Road Hospital. In all 994 persons were either vaccinated or re-vaccinated.

The Committee have very great pleasure in putting on record the excellent work done by the Medical and Sanitary Officer, Captain Chalam, during the period under report. Very recently he has been recommended for extension of his services for a further period of three years and the Committee hope that this recommendation will be accepted by Government.

APPENDIX B.

Members of the Sanitary Committee, Development Directorate for 1924-25.

(1) Lieut.-Colonel F. P. Mackie, O.B.E., M.D., M.Sc., F.R.C.P., F.R.C.S., I.M.S., Chairman, Sanitary Committee.

(2) The Director, Bacteriological Laboratory, Parel, Bombay.

(3) Lieut.-Colonel W. M. Houston, M.B., B.Ch., D.P.H., D.T.M., I.M.S.

(4) Dr. J. E. Sandilands, M.C., M.D., D.P.H.

(5) Captain E. F. W. Mackenzie, O.B.E., M.C., R.A.M.C.

(6) Khan Bahadur Dr. Nusarwanji Hormusji Choksey, C.I.E., M.D., L.M.& S., F.C.P.S.

(7) Dr. Hormusji Manekji Masina, F.R.C.S. (Eng.), L.M.&.S.

(8) Lieut.-Colonel Raghavendra Rao, O.B.E., M.D. (Lond.).

(9) Dr. Phiroz Ardeshir Dalal, L.M.& S., D.T.M.& H. (Camb.).

(10) Dr. Kavasji Byramji Shroff, L.M.& S., D.P.H., D.T.M.

APPENDIX C.

Report from Messrs. J. A. Mitchell and Company, dated the 5th June 1925, on Mumbra sand and shingle.

With reference to the Deputy Director's letter no. B-1-28 D. B. of the 17th November 1923, requesting us to proceed with the above investigation, the tests were duly put in hand and have now been completed, and we beg to report as follows.

2. Practically the only material available in the Bombay district for the preparation of concrete is trap rock, either freshly broken or as water-worn shingle and sand dredged from the creeks and rivers. Analyses of these materials show that they contain iron minerals capable of further oxidation, with consequent expansion, and in view of the nature and importance of ferro-concrete construction, it was deemed advisable to determine by experiment whether under normal conditions of working this action is likely to operate to an extent sufficient to jeopardise the stability of structures.

3. Further, the bulk of the trap used in ferro-concrete in this district is the dredged sand and shingle. From the nature of its deposition the sand contains a varying quantity of "clay" or silt, and one section of the tests was designed to ascertain to what extent the presence of this material is permissible.

4. In order to make the conditions as comparable as possible the materials used in the investigation were taken from the bulks lying at the chawls at Worli. They consisted of Mumbra sand. Sieved through 1/4 inch mesh. Mumbra shingle. Sieved through 1 1/8 inch mesh, and retained on 1/4 inch mesh.

Jubblepore cement (Previously inspected by us).—In utilising these for the tests all shingle failing to pass 1 inch mesh was eliminated, but the sand was used as received ; it contained approximately 4 per cent. of silt.

5. The tests were divided into two main sections:

1. *Concrete cubes* for crushing strength and determination of ferrous iron (Feo).

2. *Mortar briquettes* to determine the effect of the presence of clay.

Each section extended over one complete year. The results obtained are set forth on the attached sheets "A"—"G".

6. Before discussing the results in detail it may be stated here that they show :—

That the iron minerals do oxidise.

That within the period of testing, the 1 : 2 : 4 cubes (the mixture normal in ferro-concrete construction) exposed to the weather, have "matured" better than those kept inside.

That whilst the sand as received and containing 4 per cent. (approx. of "clay" gives the highest streng th, the addition of 5 per cent. "clay"

is not seriously detrimental at the longer dates, but that with any higher percentage the strength of the mortar is materially affected.

7. *Concrete Cubes.*—Two sets were prepared.

A. In the proportions of 1 cement : 2 sand : 4 shingle.

B. Do. 1 cement : 3 sard : 6 shirgle.

These proportions were taken as illustrating, "*A*" that used normally in the construction of the chawls, and "*B*" that giving a porus concrete usually.

8. All cubes were made 6″×6″×6″ and kept in a moist atmosphere for 14 days after gauging. The percentage of water used in gauging, calculated on the volume of solid materials, was

Series "A" 12·2 per cent. Series "B" 7·6 per cent.

Series "A" had a normal consistency, but series "B" was kept somewhat stiff in order to ensure its porosity.

Twenty-eight days after gauging 3 cubes of series "A" and 6 of series "B" were tested with the results given on sheet "A". Six of "B" were taken in case the somewhat dry gauging had caused irregularity of mixture. It will be seen that one cube gives an appreciably higher result than the rest. Eliminating it, the average strength of the mix is 94 tons. The results are normal.

9. At this date (28 days after gauging) the remaining cubes were dealt with as follows:—

Series "A".

1. 12 cubes exposed to the weather.

2. 12 cubes left exposed to the atmosphere of the testing room. These were tested; 6 of each at 6 months, 3 at 9 months and 3 at 12 months.

Series "B".

1. 12 cubes exposed to the weather.

2. 12 cubes left exposed in the testing room and kept alternately wet and dry.

These were tested; 3 of each at 6 months, 3 at 9 months and 6 at 12 months.

10. *Series "B" 2.*—In order to obtain an indication of the weathering effect over a period of years on porous concrete, these cubes were subjected to "intensified weathering" conditions by being alternately saturated with water and dried out. In carrying out the test distilled water was used, tap water being discarded because of its content of mineral matter, some of which would possibly be deposited in the cubes. The distilled water was allowed to drip from suitable apparatus on to each block until it was saturated, then the drip was discontinued and the block allowed to dry. When this occurred the process was repeated, and so on throughout the test.

11. The three cubes crushed at 12 months, and marked with an asterisk on sheet "B", were gauged somewhat drier than the rest and were very porous.

12. *Crushing Strengths. See sheet "B".*—An examination of the figures of *series "A"* shows that at each of the three periods the cubes exposed to the weather attained a higher strength than those left in the testing room. The relative results are :—

		Tons per square foot. Months.		
		6.	*9.*	*12.*
No. 1.	Weather	239·2	288·7	344·6
No. 2.	Testing room ..	225·5	244·9	249·2
	Superiority of 1 ..	13·7	43·8	95·4

13. Again with *series "B"* similar results have been obtained ; those cubes subjected to "intensified weather" conditions have proved more resistant to crushing than those lying in the weather.

		Tons per square foot. Months.		
		6.	*9.*	*12.*
No. 1.	Weather	117·2	172·3	158·0
No. 2.	Intensified weather ..	172·0	190·4	224·9
	Superiority of 2 ..	54·8	18·1	66·9

(Omitting the last three cubes of No. 2 which were gauged " dry ", the difference at 12 months is 85·9 tons.)

14. It will be noticed that at 9 months No. 2 shows only a slight superiority over No. 1, while at both 6 and 12 months they are substantially stronger. As stated above those cubes which had been subjected to the " intensified weather " conditions gave the higher results, and in looking for a cause for the relatively small difference at 9 months, it was noted that the 6 months cubes of No. 1 series were tested in the early part of the monsoon, while those tested at 9 months were exposed throughout the rains. The last 3 months of the 12 months cubes were dry. With the exception of No. 1 series " B ", all the cubes have shown a steady increase in strength.

15. *Alteration in state of Iron Minerals. See sheet "C".*

Series "A".—The results obtained with this mixture (1×2×4) are regular and show that the bulk of the loss in ferrous iron (FeO) takes place within 6 months.

Series " B ". (1×3×6).—The ferrous iron figures in section No. 1 are so erratic, that it is possible an error has occurred in sampling the material. They cannot be considered of any value, but have been included in the report as obtained.

16. The results of section No. 2 (" intensified weather ") show a great increase in the loss of ferrous iron at 12 months over that at 6 months. The figure of 17 per cent. is from the three cubes gauged " dry " and marked with an asterisk on sheet " B ".

17. From these results it would appear that prolonged wetting or exposure to moist atmosphere, is beneficial to the strength of the concrete, and that a *well-made* mixture in the proportions of 1 : 2 : 4 "makes up" and becomes practically impervious ; any slight oxidation of the materials tending towards this effect. But that with a concrete not sufficiently dense to "make up," , the materials may continue to oxidise beyond the strengthening stage to such an extent as to materially aid the disrupting tendency of reinforcement corroding owing to the porosity of the concrete.

18. We send herewith one bottle containing freshly broken Mumbra gravel. Before breaking, each piece appeared solid, but examination of the fractured surfaces will show in some cases that the iron minerals in the interior are undergoing oxidation. There is no reason to assume that the process will not continue if moisture obtains access to the interior of the concrete.

19. *Effect of clay.*—In carrying out the experiments to determine to what extent it is necessary to free the Mumbra sand from clay or silt some 276 briquettes were prepared and tested. They consisted of the following series :—

"*A*". Mumbra sand as received and gauged with 7 per cent. and 9 per cent. of water :—

"*B*". Mumbra sand as received *plus* 5 per cent. of trap clay.
"*C*". Do. do. 10 per cent. do.
"*D*". Do. do. 15 per cent. do.
"*E*". Do. do. 20 per cent. do.

All gauged in the proportions of 3 parts : 1 cement.

20. In gauging the briquettes containing the added clay, the sand and cement were mixed together dry, allowance being made for the clay in the quantity of sand used. The requisite proportion of dried clay was thoroughly mixed with the gauging water, and the emulsion added to the dry material. Twenty-four hours after gauging the briquettes were placed in water, which was changed every 7 days throughout the period of test.

21. The two "A" series were broken at 7 and 28 days, and at 3, 6, 9 and 12 months, and the remaining series at 2 months in addition.

For comparison a series ("O") of briquettes composed of 3 British standard sand : 1 cement was prepared and tested at the same periods.

The detailed results of the tests are set forth on sheets "D", "E" and "F", and a summary on sheet "G".

22. The two series "A1" and "A2" are of the same composition, *viz.*, 3 Mumbra sand : 1 cement, but gauged with 7 per cent. and 9 per cent. of water, respectively. 7 per cent. gave a somewhat dry mix, and the effect of not making mortar sufficiently wet is shown in the much lower strength attained as against that reached by the briquettes gauged with 9 per cent.—the correct proportion.

23. The addition of 5 per cent. of clay (series "B") necessitated a higher percentage of water in gauging, and 12 per cent. was found to give the correct consistency. The strength of the briquettes is substantially lower than series "A" at the earlier dates, but the deficiency at the end of a year is not serious.

24. Any quantity of clay above 5 per cent. is shown by the results to seriously lower the strength of the mortar.

25. The results demonstrate however, that for first class work the sand should be as free as possible from clay or silt. The sand used in these tests had been washed, and the 4 per cent. (approx.) of "clay" which it contained, was the result of "dusting" through subsequent exposure and handling.

Conclusions.

26. From the results of the above investigation we are of opinion:

1. That unless concrete prepared from Mumbra sand and shingle be made practically impervious to moisture at the time of its placing, or is of such proportions as to become so within a short period, there is a possibility that the iron minerals will oxidise to a substantial extent, and aid the disrupting effect of corroding reinforcement.

2. That a well-made mixture of 1 cement : 2 sand : 4 shingle becomes practically impervious within a short time.

3. That should the impermeability of the concrete be doubted, the surfaces should be well cement washed.

4. That from the point of view of strength, the sand and shingle are suitable.

5. That the sand should contain no more than 5 per cent. of "clay" for the most important work, but that where the maximum strength is not essential, some 4 per cent. to 5 per cent. more may be permitted.

"*A*"

Cubes.

6″×6″×6″.

Series "A" 1 cement : 2 sand : 4 shingle.
Do. "B" 1 Do. : 3 Do. : 6 Do.

Cubes kept in moist atmosphere for 14 days and then exposed to atmosphere of testing room.

Tested at 28 days.

Crushing strength in lbs.
Area 36 square inches.

	A.	*B.*
	74,260	52,670
	75,310	63,820
	74,310	54,580
		51,150
		52,130
		52,700
Average ..	74,613	54,520
Tons per square foot ..	133·2	97·3

At the end of 28 days each series of cubes was sub-divided as follows:
Series "*A*".

1. Cubes exposed to weather.
2. Cubes left exposed to atmosphere of testing room.

Series "*B*".

1. Cubes exposed to weather.
2. Cubes left exposed in testing room and kept alternately wet and dry.

"*B*"

Crushing strength in Lbs.

Area 36 square inches.

	A.		B.	
	1	2	1	2
Six Months ..	120,460	122,790	....	....
	131,070	127,330	....	....
	135,640	113,640	....	....
	135,620	129,860	64,100	95,280
	140,370	132,770	64,620	85,420
	142,120	124,680	68,110	108,560
Average ..	134,213	125,178	65,610	96,420
Tons per square foot ..	239·2	225·5	117·2	172·0
Nine Months ..	164,010	132,840	104,750	121,340
	174,590	133,840	91,930	102,830
	146,500	144,660	92,540	95,680
Average ..	161,700	137,113	96,506	106,617
Tons per square foot ..	288·7	244·9	172·3	190·4
Twelve Months ..	....	....	87,670	132,640
	....	....	87,470	134,460
	....	....	89,160	142,630
	188,490	137,710	86,370	114,590
	193,690	144,010	84,720	105,630
	196780	137,030	96,240	125,960
Average ..	192,987	139,583	88,503	125,084
Tons per square foot ..	344·6	249·2	158·0	224·9

"*C*"

ALTERATION OF STATE OF IRON MINERALS IN THE CONCRETE.

Indicated by loss of ferrous iron (Fe O).

Series "*A*". 1 cement : 2 sand : 4 shingle.

1. Cubes exposed to weather.
2. Cubes exposed in testing room.

Series "*B*". 1 cement : 3 sand : 6 shingle.

1. Cubes exposed to weather.
2. Cubes exposed in testing room and kept alternately wet and dry.

——	Percentage of ferrous iron (Fe O).				
	In dry Mix.	After 6 Mos.	After 12 Mos.	Per cent. Loss at 6 Mos.	Per cent. Loss at 12 Mos.
Series "A"—					
1	5·980	5·386	5·320	9·94	11·04
2	5·980	5·345	5·214	10·62	12·81
Series "B".—					
1	6·220	5·140	5·735	17·36	7·80
2	6·220	5·669	5·270	8·86	15·27
			5·160		17·00

"*D*"

BRIQUETTES.

1″ × 1″ *in section. lbs per square inch.*

"*A*" *series.*

3 Mumbra sand as received : 1 cement.

Per cent. Water.	Temp. F.		Days.			Months.		
	Air.	Water.	7	28	3	6	9	12
7	75·0	73·0	280	370	585	520	515	560
			305	410	470	460	560	455
			290	415	595	490	420	530
	80·0	76·0	290	420	545	480	480	470
			255	340	635	465	465	485
			260	375	475	385	470	460
		Average ..	280	388	551	467	485	493
9	75·0	73·0	325	425	545	610	700	670
			380	490	540	580	650	660
			350	490	625	500	510	575
			360	485	595	535	620	600
	80·0	76·0	370	425	575	620	700	570
			350	445	585	575	660	605
		Average ..	356	450	578	570	673	613

"*E*"

BRIQUETTES.

1" × 1" *in section. lbs. per square inch.*

"*B*" *series.*

3 Mumbra sand containing 5 per cent. added clay : 1 cement.

Per cent. Water.	Temp. F.		Days.		Months.				
	Air.	Water.	7	28	2	3	6	9	12
			260	355	405	455	575	590	590
			320	380	400	440	550	565	640
12	87·0	87·0	280	360	430	480	530	605	575
	89·5	89·0							
			270	375	430	480	498	535	565
			310	320	440	480	515	530	570
			290	370	420	490	555	560	580
		Average ..	288	360	421	471	536	564	587

"*C*" *series.*

3 Mumbra sand containing 10 per cent. added clay : 1 cement.

			170	260	345	340	410	440	480
			180	230	320	335	435	495	505
			175	275	320	315	410	465	472
14·0	86·5	85·0	185	265	365	350	455	470	510
	88·5	87·0							
			180	250	350	330	475	490	490
			200	260	340	350	480	550	520
		Average ..	182	257	333	337	444	485	496

"*F*"
BRIQUETTES.

1″ × 1″ *in section. lbs. per square inch.*

"*D*" *series*

3 Mumbra sand containing 5 per cent. added clay : 1 cement.

Per cent. Water.	Temp. F.		Days.		Months.				
	Air.	Water.	7	28	2	3	6	9	12
			190	245	340	340	460	410	425
			155	245	320	340	445	460	500
			185	245	310	345	460	400	440
14·5	86·5 / 89·0	85·0 / 88·0	190	210	320	330	435	415	385
			195	230	300	345	400	460	430
			185	235	320	340	430	460	545
		Average ..	183	235	318	340	438	434	481

"*E*" *series.*

3 Mumbra sand containing 20 per cent. added clay : 1 cement.

			200	300	325	330	450	410	375
			180	310	325	350	415	440	425
			210	245	330	340	410	435	420
15·0	86·5 / 90·0	85·0 / 88·0	180	295	310	350	420	435	380
			190	295	330	335	400	425	465
			170	290	335	345	425	475	385
		Average ..	188	289	326	342	423	437	408

"G"

BRIQUETTES.

SUMMARY OF RESULTS.

Column "O" 3 British standard sand : 1 cement.

,, "A 1" 3 Mumbra sand : 1 cement gauged with 7 per cent. water.

,, "A 2" 3 Mumbra sand : 1 cement gauged with 9 per cent. water.

,, "B" 3 Mumbra sand containing 5 per cent. added clay : 1 cement.

,, "C" 3 Mumbra sand containing 10 per cent. added clay : 1 cement.

,, "D" 3 Mumbra sand containing 15 per cent. added clay : 1 cement.

,, "E" 3 Mumbra sand containing 20 per cent. added clay : 1 cement.

	Pounds per square inch.						
	O	A1	A2	B	C	D	E
7 Days ..	278	280	356	288	182	183	188
28 Days ..	310	388	450	360	257	235	289
2 Months ..	..	..	..	421	333	318	326
3 Months ..	337	551	578	471	337	340	342
6 months ..	328	467	570	536	444	438	423
9 Months ..	304	485	673	564	485	434	437
12 Months ..	316	493	613	587	496	481	408

APPENDIX D.

Members of the Advisory Committees for Bombay City and Suburbs for 1924-25.

BOMBAY.

	Name of Member.	Constituency.
1.	Dr. Nadirshaw H. E. Sukhia, L.M.&S., L.V.Sc. (Spl.), F.R.S.I. (Lond.)	Bombay Municipality.
2.	Fazal Ibrahim Rahimtoola, Esq., B. A.	Do. do
3.	R. H. A. Delves, Esq., F.S.I.	.. City of Bombay Improvement Trust.
4.	E. C. Reid, Esq.	.. Bombay Chamber of Commerce.
5.	Jehangir Bomanji Petit, Esq.	.. Bombay Millowners' Association.
6.	Manu Subedar, Esq.*	.. Indian Merchants' Chamber.
7.	F. G. Scowen, Esq.	.. Bombay Presidency Trades' Association.
8.	S. K. Bole, Esq., M.L.C.	.. Working Classes.
9.	Joseph Baptista, Esq., L.C.E. (Bom.), B.A. LL.B. (Cant.), Bar.-at-law, M.L.C.	Do.

BOMBAY SUBURBAN REVENUE DIVISION.

1.	Ig. D'Monte, Esq.†	.. Bandra Municipality.
2.	D. D. Rodrigues, Esq.	.. Kurla Municipality.
3.	P. J. Vakil, Esq., B.A., LL.B.	.. Ghatkopar-Kirol Municipality.
4.	Janmejay Chhabildas, Esq., M.A. (Cant.).	.. Notified Area Committees.

* Mr. Manu Subedar was elected by the Indian Merchants' Chamber in place of Mr. Manmohandas Ramji who resigned his seat on the Committee in November 1924.

† Mr. Ig. D'Monte was elected by the Bandra Municipality in place of Mr. Augustus Pereira who resigned his seat on the committee in October 1924.

APPENDIX E.

DEVELOPMENT DIRECTORATE.

	Designation.	Name.
1.	Director of Development ..	Sir Lawless Hepper, Kt., J.P.
2.	Deputy Director of Development; Secretary to Government, Development Department; Commissioner, Bombay Suburban Division and Settlement Commissioner, and Director of Land Records, Bombay Suburban Division.	*J. R. Martin, C.I.E., I.C.S., J.P.* (*on leave*). R. D. Bell, C.I.E., I.C.S., J.P. (acting).
3.	Deputy Secretary to Government, Development Department; Secretary to the Development Directorate and Assistant Commissioner, Bombay Suburban Division.	H. St. C. Smith, J.P.
4.	Assistant Secretary to Government, Development Department.	R. B. Vachha, M.A., J.P.

Reclamation Branch.

5.	Chief Engineer, Reclamation Branch. ..	H. A. Elgee, M.I.C.E.
6.	Deputy Chief Engineer, Reclamation Branch, Marine Lines Section. ..	G. M. O'Rorke, C.I.E., M.B.E. B.A.I., A.M.I.C.E. (also supervising the Quarry Section).
7.	Deputy Chief Engineer, Reclamation Branch, Colaba Section. ..	P. Billinton.
8.	Deputy Chief Engineer, Dredging Section. ..	C. R. Brims.
9.	Executive Engineer, Projects ..	W. H. Thomas, A.C.G.I., A.M.I.C.E.
10.	Executive Engineer, Reclamation Branch. ..	W. F. Anderson, A.M.I.C.E.
11.	Marine Surveyor	G. D. Kundaji, M.R.San.I. (Lond.), A.M.I.E.S. (Glas.).
12.	Executive Engineer-in-charge Quarry Section. ..	C. G. Croudace.
13.	Assistant Engineer	S. M. Abdullah, A.M.I.E., (Ind.), M.R.San.I. (Lond.).
14.	Do. do. ..	A. N. Seal, B.Sc. (Lond.).
15.	Do. do. ..	Badrinath Sadanand.
16.	Do. Dredging Section ..	F. M. Surveyor.

	Designation.	Name.
17.	Quarry Master ..	.. E. O. Roberts.
18.	Mechanical Engineer, Quarry	.. A. Bellefontaine.
19.	Dredging Master ..	.. W. S. Speirs.
20.	Sanitary and Medical Officer, Back Bay Reclamation Scheme.	B. S. Chalam.

No. 1 Housing and Materials Division.

21.	Superintending Engineer, No. I Housing and Materials Division ..	T. Harvey, M.Sc., M.I.C.E., J.P.
22.	Executive Engineer, Bombay Housing District No. I.	.. J. R. Colabawalla, M.S.E. (Lond.), M.I.E. (India), Assoc. M.Am.Soc.C.E., Assoc. A.I.E.E.
23.	Executive Engineer, Bombay Housing District No. II.	.. A. Hamid, F.Sc.
24.	Executive Engineer, Bombay Housing Sanitary District.	.. Rao Saheb P. S. Krishnasami Ayyar.
25.	Executive Engineer, Mechanical and Materials District.	.. W. K. Caldwell.
26.	Assistant Engineer ..	.. M. A. Dhoria, B.A., B.E.
27.	Do. do. ..	.. S. S. Rajadhyaksha, B.A., B.E.
28.	Assistant Engineer ..	.. *Sardar Kala Singh* (*on leave*).
29.	Do. do. ..	.. Mahomed Hashim, B.E., M.R. San.I., A.M.I.E.
30.	Do. do. ..	.. *Vacant.*
31.	Do. do. ..	.. *Vacant.*
32.	Do. do ..	.. J. D. Daruwala.
33.	Do. do. ..	.. K. L. Mahindru.
34.	Do. do. ..	.. Nand Kishor Agrawal.

No. 2 Suburban Division.

35.	Superintending Engineer, No. 2 Suburban Division.	.. *A. F. Macdonald Clark, M.A. B.Sc., M.I.C.E., J.P.* (*on leave*). Colonel R. St. J. Gillespie, C.I.E., O.B.E., J.P. (acting in addition to his own duties).

	Designation.	Name.
36.	Electrical and Mechanical Engineer	A. Lennox Stanton, M.I.M.E., M.I.E.E., M.Am.S.M.E., M.I.E. (India).
37.	Executive Engineer, Andheri District.	*D. K. Bhave, L.C.E.,M.A., B.A.C. A. M. Inst. C.E., A.M.I. Mech.E.* (*on leave*).
		T. S. Soorma, B.E. (acting in addition to his own duties).
38.	Executive Engineer, Suburban Sanitary District.	T. S. Soorma, B.E. (*Vide* entry No. 37).
39.	Executive Engineer, Kurla-Trombay District.	T. A. Pereira.
40.	Assistant Engineer ..	.. Rao Saheb K. C. Advani, L.C.E., A.M.I.E. (works also as Personal Assistant to the Superintending Engineer, No. 2 Suburban Division).,
41.	Do. do. ..	.. H. K. Vacha, B.A., B.E., A.M.I.E.
42.	Do. do. ..	.. F. J. Campos, B.E.
43.	Do. do. ..	.. Ramlal Suri.
44.	Do. do. ..	.. R. S. Borker.
45.	Do. do. ..	.. *T. V. Sunderasan, B.A., B.E.* (*on leave*).

Suburban Survey.

46.	Superintendent, Bombay Suburban Survey.	.. W. J. Neyland, J.P.

Land Acquisition, Bombay.

47.	Land Acquisition Officer for the City of Bombay.	.. G. C. Rowe, F.S.I., J.P.
48.	Personal Assistant to the Land Acquisition Officer for the City of Bombay.	.. S. D. Nariman, B.A.

Land Manager, Development Directorate.

49.	Land Manager, Development Directorate.	.. E. M. Gilbert-Lodge, F.S.I. F.I.A., F.A.I., J.P.
50.	Personal Assistant to the Land Manager, Development Directorate.	.. K. R. Doctor, F.S.I., L.C.E., A.M.I.E.

	Designation.	Name.
	Salsette Development.	
51.	Collector, Bombay Suburban District and Salsette Development Officer.	E. W. Perry, I.C.S., J.P.
52.	Personal Assistant to the Salsette Development Officer.	D. G. Sowani, B. Sc., B.E.
53.	Deputy Collector and Assistant Development Officer, Bandra Ambernath.	P. H. Dowan, B.A.
54.	Assistant Development Officer, Trombay.	*Vacant.*
55.	Assistant Development Officer, Kurla.	D. M. Ranadive, B.A.
56.	Special Assistant to the Collector, Bombay Suburban District.	E. de B. Jewell.
	Audit and Finance.	
57.	Financial Adviser to Government	A. V. V. Aiyar, C.I.E.
58.	Deputy Financial Adviser to Government and Audit and Accounts Officer, Bombay Development Scheme.	S. M. L. Bean.
59.	Assistant Audit and Accounts Officer, Bombay Development Scheme.	R. Hogan (on deputation K. M. Elijah (acting).
60.	Special Officer, Development Directorate chawls.	R. Hogan.
	Military Lands Scheme.	
61.	Secretary, Board of Control and Chief Engineer.	Colonel R. St. J. Gillespie, C.I.E., O.B.E., J.P. (*Vide* also entry No. 35).
62.	Deputy Chief Engineer	*Vacant.*
63.	Executive Engineer.	F. Walker.
64.	Assistant Engineer	I. C. Dare, B.A., F.R.S.A., F.S.I., A.M.I.C.E., M.I.S.E.
65.	Do.	*Vacant.*
66.	Do.	B. M. Flores, B.A., B.E.
67.	Do.	*Vacant.*

	Designation.	Name.
68.	Architect	.. J. Fernandez.
69.	Financial Adviser to the Board of Control, Military Lands Scheme.	.. S. M. L. Bean.

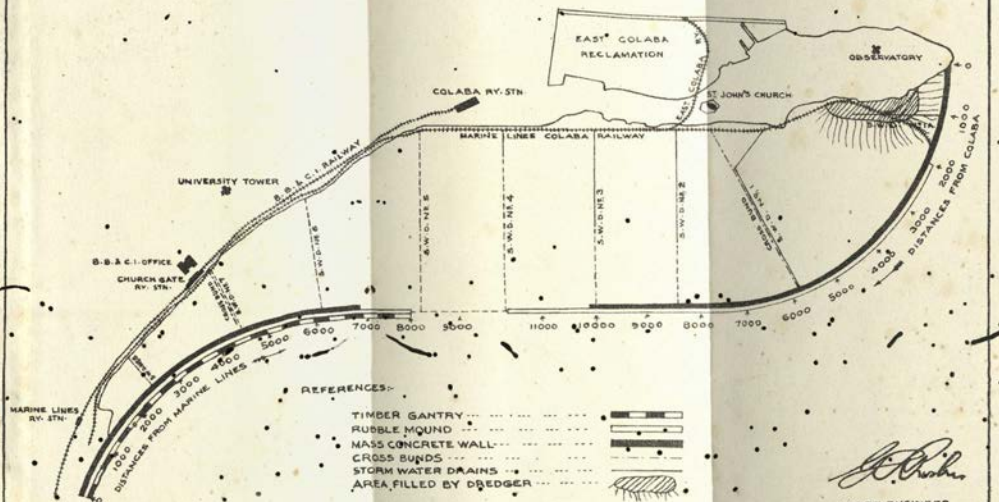
Consulting Town Planner.

70.	Consulting Town Planner	.. W. R. Davidge, F.R.I., B.A., F.S.I., A.M.Inst.C.E.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

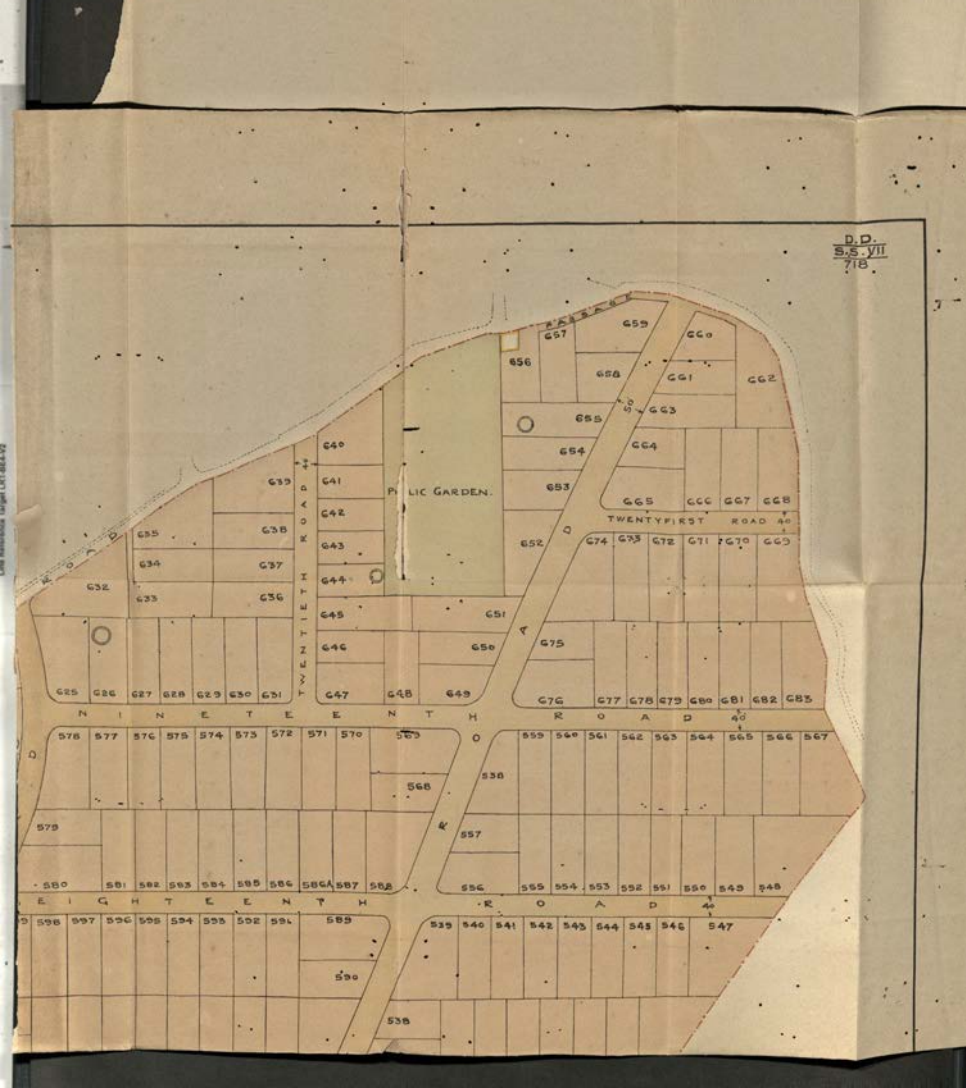
BACK BAY RECLAMATION SCHEME

DIAGRAM SHOWING THE PROGRESS OF WORK UPTO 31ST MARCH 1925



SANTACRUZ T. P. SCHEME: No 4
LAND MANAGER
DEVELOPMENT DIRECTORATE.

PLAY GROUND
SIXTEENTH
FIFTEENTH
FOURTEENTH
LINKING
DINNAYARRA
KHARKOAD
7TH ROAD
DATED 6-1-26

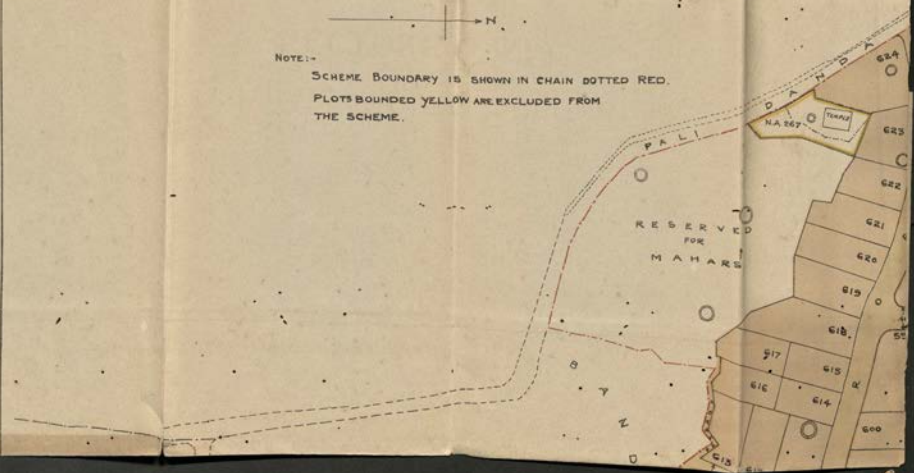

D.D.
S.S. VII
718
PUBLIC GARDEN.
TWENTYFIRST ROAD 40
NINETEENTH ROAD 40
EIGHTEENTH ROAD 40
TWENTIETH ROAD 40
ALBANY

KHAR MODEL SUBURB
SECTORS C & D.

SCALE 100' = 1 INCH.

N.

NOTE:-
SCHEME BOUNDARY IS SHOWN IN CHAIN DOTTED RED.
PLOTS BOUNDED YELLOW ARE EXCLUDED FROM THE SCHEME.



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